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MEMORANDUM

TO: MR WILLIAM CATON
SECRETARY FCC

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VIA:

FROM: HATFIELD & DAWSON JAMES B. HATFIELD, P.E.

DATE: 4/22/94

ENCLOSED: REPLY COMMENTS ET DOCKET 93-62

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Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of

Guidelines for Evaluating the
Environmental Effects of
Radiofrequency Radiation

ET Docket 93-62

Reply Comments of Hatfield & Dawson Consulting Engineers Inc.

INTRODUCTION

In these Reply Comments we attempt to address some additional questions contained in the Notice, respond to certain comments submitted in this matter, and report the results of preliminary induced current measurements made by this firm.

Low Power Devices/Exclusions

We have made extensive base station antenna measurements over the years for a variety of Cellular, Paging and other users of the 800 to 900 MHz portion of the spectrum. Our data indicate that whole body exposure, based upon spatially averaged measurements, does not exceed the Maximum Permissible Exposure (MPE) limits in Table 2 of C95.1-1992 at distances greater than 20 cm from the base station antennas. Measured localized fields from these classes of low power antennas are a small fraction of the partial body exposure limits shown in Table 3 of that standard. The average duty cycle and low power of these antennas combine to minimize human exposure relative to the time averaged C95.1-1992 MPEs. We support the Commission in its continuance of the low power device exclusion for the base station antennas operated by these users of the UHF spectrum.

Effectiveness of Personal Monitors/Dosimeters

We have had the opportunity to perform limited testing of the *narda* Model 8842C-0.5 *nardalert* personal magnetic field monitor. This device provides spot measurements of the magnetic field, weighted to match the variation of C95.1-1992 MPE with frequency, from 50 to 1000 MHz. This monitor provides an alarm when the magnetic field in the forward direction is 50% and when the magnetic field from the side is 100% of the C95.1-1992 MPE, respectively. Our use of this device was on the ground near FM antennas and on rooftops near 800 MHz antennas. The *nardalert* provided worst case indications of localized fields when the measured fields were at or above the levels shown in Table 1 of C95.1-1992. Either magnetic or electric field sensing provides an equivalent measure of exposure since both components of the electromagnetic wave vary greatly

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over relatively small distances in a reflective/re-radiative VHF or UHF environment. The magnetic field is often sensed for the determination of RF exposure because magnetic fields are less susceptible to perturbation by nearby objects than electric fields.

Measured Induced Currents

We conducted measurements of induced currents at two locations below FM antennas. A Narda Model 8850-10 Induced Current Meter (3KHz - 110MHz) was used to make the measurements. Foot currents for two different height males and one female were made. When the spatially averaged field (measured using a Datalogger and a Holaday Isotropic Electric Field Probe) was $530 \mu\text{W}/\text{cm}^2$ the induced currents for the three subjects ranged from 47 to 70 milli Amperes (mA) through both feet. When the spatially averaged field was $1039 \mu\text{W}/\text{cm}^2$, the contact current through both feet of the three subjects varied from 27 to 45 mA. The Uncontrolled Environment contact current limit shown in Part B of Table 2 of C95.1-1992 for 100 MHz is 90 mA through both feet. The corresponding limit for Controlled Environments is 200 mA. These limited measurements indicate that the induced currents are not always linearly related to field exposure and that, in some circumstances, are lower than might be expected even when the spatially averaged fields are at the Controlled Environment MPE limit. The fact that the induced currents were generally well below the C95.1-1992 limits demonstrates the effect of highly reflective environments upon measured fields. Electric fields reflected from the ground have predominately horizontal plane polarization while induce currents are mainly the result of vertically polarized electric fields. The conclusion is that fields measured with isotropic probes are not always a good indication of the magnitude of induced foot currents.

Adoption of IEEE/ANSI C95.1-1992

C95.1-1992 incorporates risk assessment based upon a later body of research than that used as a basis for the NCRP Report No. 86 standard; both standards are based upon the same biological effects. Recent contact and induced current research is included in C95.1-1992 which it is not a part of the NCRP standard. The magnetic field exposure limits at AM frequencies are also based upon more recent research data than the equivalent exposure limits in the NCRP standard. The changes in the higher frequency MPEs specified in C95.1-1992 were made to provide consistency with standards written for frequencies above 300 GHz. For these reasons, and because it is more complete, we support the adoption of IEEE/ANSI C95.1-1992. Inadequacies in the C95.1-1992 standard such as definitional problems (i.e. Controlled vs Uncontrolled environments, etc.), MPEs that vary arbitrarily or have different units at different AM or FM frequencies, and the 100 MHz contact and induced current cut-off can be selectively resolved by the Commission.

Conclusions

1) Base station 800 to 900 MHz antennas that we have measured do not exceed the time averaged whole (spatially averaged) or partial body exposure limitations of C95.1-1992. Our experience thus indicates that continuation of the low power exclusion will not result in violation

of that exposure standard in the 800 to 900 MHz band.

2) Personal monitors such as the ~~nardalert~~ provide a worst case exposure estimate according to our limited tests.

3) Our measurements indicate that induced currents do not track spatially averaged measured field exposures made using isotropic electric field probes. Induced currents can be well below exposure limits when measured field MPEs are exceeded.

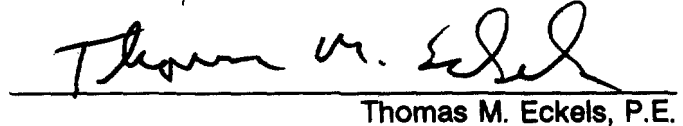
4) We support the adoption of ANSI/IEEE C95.1-1992 by the Commission because it is a more up to date and complete standard.

April 22, 1994

HATFIELD & DAWSON CONSULTING ENGINEERS, INC.


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